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ABSTRACT

This teacher guide is part of the materials prepared for an individualized program for ninth-grade algebra and basic mathematics students. Materials written for the program are to be used with audiovisual lessons recorded on tape cassettes. For an evaluation of the program, see ED 086 545. In this guide, the teacher is provided with objectives for each topic area and guided to materials written for a given topic. Three short criterion tests are included for each topic covered. Properties of real numbers are developed through a set of axioms in this package. This work was prepared under an ESEA Title III contract. (JP)

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ALGEBRA I

Package 03-03

ADDITION AND MULTIPLICATION OF REAL NUMBERS

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SE 017 567

ADDITION AND MULTIPLICATION OF REAL NUMBERS

In this unit, we begin the study of the structure of algebra by calling attention to some of the axioms, or postulates, for the set of real numbers. It is hard to realize the importance of some of these postulates because they seem to be such obvious statements. You will be tempted to brush some of them aside and ignore them. Don't yeild to this temptation; remember, you can't build a house until you learn how to hammer a nail.

Many of these axioms, or postulates, will be referred to by name later in the course. You must be familiar with their names as well as their meanings.

PACKAGE GOAL: to understand some of the basic assumptions on which algebra is built and be able to apply them.

PACKAGE OBJECTIVES:

1. Given a set and an operation, tell if the set is closed under that operation.

2. Given a true sentence, indicate which axioms and principles are illustrated by the sentence.

3. Given a numerical expression involving addition and the "opposite" of a number, simplify the expression.

4. Given an open sentence involving the absolute value of a number, specify the solution set by graph.

5. Given a numerical expression involving addition, simplify the expression.

6. Given a variable expression, simplify by using the distributive axiom.

7. Given an expression that contains an indicated product, simplify the expression.

8. Given an expression that requires the application of the property of the reciprocal of a product, simplify the expression.

I. U. # 03-03-01

Axiom of Closure

You need to recall:

The quantifier, "for all", is another form of "for each". Therefore, a statement such as, "for all a and b, the sum a + b is 5" can be shown to be <u>false</u> by finding only <u>one</u> replacement for a and b such that $a + b \neq 5$.

OBJECTIVES:

1. When asked to state the axiom of closure for addition, you will write "For all real numbers a and b, the sum a + b is a unique real number."

2. When asked to state the axiom of closure for multiplication, you will write "For all real numbers a and b, the product ab is a unique real number".

3. Given a set and an operation, tell if the set is closed under that operation.

ACTIVITIES:

Study:
<u>S & M</u>: pages 63-64 (to paragraph three on page 64.) (objective 1,2,3)

Suggested exercises:
<u>S & M</u>: page 66; exs. 1 - 10 (objective 3)

Criterion Test 03-03-01-1

1. Write the axiom of closure for addition.

2. Write the axiom of closure for multiplication.

3. Indicate whether each of the sets is "closed" or "not closed" under the given operation.

   (a) {0, 1, 2, 3}, addition

   (b) {1}, multiplication

   (c) {the positive even integers}, multiplication by 4.

Criterion Test 03-03-01-2

1. Write the axiom of closure for addition.

2. Write the axiom of closure for multiplication.

3. Indicate whether each of the sets is "closed" or "not closed" under the given operation.

   (a) {1, 3, 5}, multiplication

   (b) {the powers of 2}, multiplication

   (c) {0, 2, 4, 6, . . .}, addition

Criterion Test 03-03-01-3

1. Write the axiom of closure for addition.

2. Write the axiom of closure for multiplication.

3. Indicate whether each of the sets is "closed" or "not closed" under the given operation.

   (a) {0, 1}, multiplication

   (b) {the natural numbers}, subtraction

   (c) {0, 5, 10, 15, . . .}, addition

Answers

Criterion Test 03-03-01-01

1. For all real numbers a and b, the sum a + b is a unique real number.

2. For all real numbers a and b, the product a · b is a unique real number.

3. (a) not closed
   (b) closed
   (c) closed

Criterion Test 03-03-01-02

1. For all real numbers a and b, the sum a + b is a unique real number.

2. For all real numbers a and b, the product a · b is a unique real number.

3. (a) not closed
   (b) closed
   (c) closed

Criterion Test 03-03-01-03

1. For all real numbers a and b, the sum a + b is a unique real number.

2. For all real numbers a and b, the product a · b is a unique real number.

3. (a) closed
   (b) not closed
   (c) closed

I. U. # 03-03-02

Identifying Axioms

OBJECTIVES:

1. When asked to state the reflexive property of equality, you will write, "For all real numbers a, a = a".

2. When asked to state the symmetric property of equality, you will write, "For all real numbers a and b: If a = b, then b = a".

3. When asked to state the transitive property of equality, you will write, "For all real numbers a, b, and c: If a = b and b = c, then a = c".

4. When asked to state the commutative axiom of addition, you will write, "For all real numbers a and b, a + b = b + a".

5. When asked to state the commutative axiom of multiplication, you will write, "For all real numbers a and b, ab = ba".

6. When asked to state the associative axiom of addition, you will write, "For all real numbers a, b, and c, (a + b) + c = a + (b + c)".

7. When asked to write the associative axiom of multiplication, you will write, "For all real numbers a, b, and c, (ab)c = a(bc)".

8. Given a true sentence, indicate which axioms and principles are illustrated by the sentence.

ACTIVITIES:

Study:
S & M: page 64, beginning with paragraph three. (objectives 1, 2, 3, and 8)
pages 66 - 68 (objectives 4, 5, 6, 7, 8)

Suggested exercises:
S & M: page 65; ex. 15 - 24 (objectives 1, 2, 3, 8)
page 68; ex. 1 - 20 (objectives 4, 5, 6, 7, 8)

Criterion Test 03-03-02-01

1. State the reflexive property of equality.

2. State the symmetric property of equality.

3. State the transitive property of equality.

4. State the commutative axiom of addition.

5. State the commutative axiom of multiplication.

6. State the associative axiom of addition.

7. State the associative axiom of multiplication.

8. Name the axiom illustrated by each of the following true sentences.

   (a) $7 \cdot 5 = 5 \cdot 7$
   (b) If $x + y = 5$, then $5 = x + y$
   (c) $9 \cdot (3 \cdot 6) = (3 \cdot 6) \cdot 9$
   (d) $3 + (5 + y) = 8 + y$

Criterion Test 03-03-02-02

1. State the reflexive property of equality.

2. State the symmetric property of equality.

3. State the transitive property of equality.

4. State the commutative axiom of addition.

5. State the commutative axiom of multiplication.

6. State the associative axiom of addition.

7. State the associative axiom of multiplication.

8. Name the axiom illustrated by each of the following true sentences.

   (a) $7 + 6 = 6 + 7$
   (b) $9 + (7 + 3) = (7 + 3) + 9$
   (c) $x + y = x + y$
   (d) $(5 \cdot 3) \cdot 2 = 5 \cdot (3 \cdot 2)$

Criterion Test 03-03-02-3

1. State the reflexive property of equality.

2. State the symmetric property of equality.

3. State the transitive property of equality.

4. State the commutative axiom of addition.

5. State the commutative axiom of multiplication.

6. State the associative axiom of addition.

7. State the associative axiom of multiplication.

8. Name the axiom illustrated by each of the following true sentences.

   (a) If $x = 3$ and $3 = y$, then $x = y$.

   (b) $8 \cdot (5 \cdot 3) = (8 \cdot 5) \cdot 3$

   (c) $-3 + 0 = 0 + -3$

   (d) $(x + 7) + 3 = x + 10$

Answers:

Criterion Test 03-03-02-01

1. For all real numbers a, a = a.

2. For all real numbers a and b; If a = b then b = a.

3. For all real numbers a, b, and c: If a = b and b = c, then a = c.

4. For all real numbers a and b, a + b = b + a.

5. For all real numbers a and b, ab = ba.

6. For all real numbers a, b, and c, (a + b) + c = a + (b + c).

7. For all real numbers a, b, and c, (ab)c = a(bc).

8. (a) commutative axiom of multiplication
   (b) symmetric property of equality
   (c) commutative axiom of multiplication
   (d) associative axiom of addition and substitution principle.

Criterion Test 03-03-02-02

1. For all real numbers a, a = a.

2. For all real numbers a and b; If a = b, then b = a.

3. For all real numbers a, b, and c: If a = b and b = c, then a = c.

4. For all real numbers a and b, a + b = b + a.

5. For all real numbers a and b, ab = ba.

(continued)

Answers (continued)

6. For all real numbers a, b, and c, $(a + b) + c = a + (b + c)$.

7. For all real numbers a, b, and c, $(ab)c = a(bc)$.

8. (a) commutative axiom of addition
   (b) commutative axiom of addition
   (c) reflexive property of equality
   (d) associative axiom of multiplication

Criterion Test 03-03-02-03

1. For all real numbers a, $a = a$.

2. For all real numbers a and b: If $a = b$ then $b = a$.

3. For all real numbers a, b, and c: If $a = b$ and $b = c$, then $a = c$.

4. For all real numbers a and b, $a + b = b + a$.

5. For all real numbers a and b, $ab = ba$.

6. For all real numbers a, b, and c, $(a + b) + c = a + (b + c)$.

7. For all real numbers a, b, and c, $(ab)c = a(bc)$.

8. (a) transitive property of equality
   (b) associative property of multiplication
   (c) commutative axiom of addition
   (d) associative axiom of addition and substitution principle.

I. U. # 03-03-03

The Opposite of a Real Number

OBJECTIVES:

1. When asked to state the additive axiom of zero, you will write, "The set of real numbers contains a unique element 0 having the property that for every real number a, $a + 0 = a$ and $0 + a = a$".

2. Given an expression involving the addition of real numbers, simplify the expression.

3. When asked to state the axiom of opposites, you will write, "For every real number a there is a unique real number $\bar{}a$ such that $a + (\bar{}a) = 0$ and $(\bar{}a) + a = 0$".

4. Given a numerical expression involving addition and the opposite of a number, simplify the expression.

ACTIVITIES:

Study:
S & M: pages 70 - 73, (objectives 1, 2, and 4)
pages 76 - 78, (objectives 3 and 4)

Suggested exercises
S & M: page 74; ex. 1 - 13, odd (objectives 1, 2, and 4)
pages 78 - 79; 1 - 15, odd (objectives 3 and 4)

Criterion Test 03-03-03-01

1. State the addition axiom of zero.

2. Simplify each expression.

   (a) $^{-}6 + {}^{-}8$
   (b) $({}^{-}5 + 5) + {}^{-}6\ 1/2$
   (c) $7 + {}^{-}5$

3. State the axiom of opposites.

4. Simplify each expression.

   (a) $-\ ({}^{-}6) + 4$
   (b) $-\ ({}^{-}3 + 8)$
   (c) $-\ [8 + ({}^{-}5)]$

Criterion Test 03-03-03-02

1. State the addition axiom of zero.

2. Simplify each expression.

   (a) $^{-}12 + 5$
   (b) $({}^{-}6 + 3) + {}^{-}\ 3\ 3/4$
   (c) $3 + {}^{-}3$

3. State the axiom of opposites.

4. Simplify each expression.

   (a) $-({}^{-}5) + 4$
   (b) $-({}^{-}8 + 5)$
   (c) $-[7 + ({}^{-}3)]$

Criterion Test 03-03-03-03

1. State the addition axiom of zero.

2. Simplify each expression.

   (a) $^{-}8 + 4$
   (b) $(^{-}6 + 8) + 2\ 1/2$
   (c) $^{-}6 + ^{-}8$

3. State the axiom of opposites.

4. Simplify each expression.

   (a) $^{-}(^{-}7) + 2$
   (b) $-(^{-}8 + ^{-}2)$
   (c) $-[^{-}3 + (^{-}7)]$

Answers:

Criterion Test 03-03-03-01

1. The set of real numbers contains a unique element 0 having the property that for every real number a, $a + 0 = a$ and $0 + a = a$.

2. (a) $^{-}14$
   (b) $^{-}6\ 1/2$
   (c) 2

3. For every real number a there is a unique real number ^{-}a such that $a + (^{-}a) = 0$ and $(^{-}a) + a = 0$.

4. (a) 10
   (b) $^{-}5$
   (c) $^{-}3$

Criterion Test 03-03-03-02

1. The set of real numbers contains a unique element 0 having the property that for every real number a, $a + 0 = a$ and $0 + a = a$.

2. (a) $^{-}7$
   (b) $^{-}6\ 3/4$
   (c) 0

3. For every real number a there is a unique real number ^{-}a such that $a + (^{-}a) = 0$ and $(^{-}a) + a = 0$.

4. (a) 9
   (b) 3
   (c) $^{-}4$

Answers:

Criterion Test 03-03-03-03

1. The set of real numbers contains a unique element 0 having the property that for every real number a, $a + 0 = a$ and $0 + a = a$.

2. (a) $^{-}4$
   (b) 4 1/2
   (c) $^{-}14$

3. For every real number a there is a unique real number ^{-}a such that $a + (^{-}a) = 0$ and $(^{-}a) + a = 0$.

4. (a) 9
   (b) 10
   (c) 10

I. U. # 03-03-04

Absolute Value

OBJECTIVES:

1. Given an expression involving absolute value, determine the value of the expression.

2. Given an open sentence involving the absolute value of a number, specify the solution set by graph.

ACTIVITIES:

Study:

S & M: pages 79 - 80 (objectives 1 and 2)

Suggested exercises:

S & M: page 81; ex. 1 - 11 odd (objective 1)
pages 81 - 82; ex. 13 - 23, odd (objective 2)

Criterion Test 03-03-04-01

1. Determine the value of each expression.

   (a) $|-8 + 5| - 3$
   (b) $3|-4| + |-5|$
   (c) $-|3|$

2. Specify the solution set of each equation or inequality by graph.

   (a) $|x| + 6 = 20$
   (b) $|x| > 2$
   (c) $|x| \leq 4$

Criterion Test 03-03-04-02

1. Determine the value of each expression.

   (a) $|7 + (-4)| + 4$
   (b) $3|-5| + |3|$
   (c) $-|8|$

2. Specify the solution set of each equation or inequality by graph.

   (a) $|x| + (-3) = 1$
   (b) $|x| > 3$
   (c) $|x| \leq 2$

Criterion Test 03-03-04-03

1. Determine the value of each expression.

   (a) $|-3 + 1| + 4$
   (b) $|-7| + 3|-2|$
   (c) $-|4|$

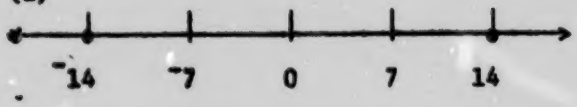
2. Specify the solution set of each equation or inequality by graph.

   (a) $|x| + 1 = 6$
   (b) $|x| \leq 6$
   (c) $|x| > 2$

Answers:

Criterion Test 03-03-04-01

1. (a) 0 (b) 17 (c) -3
2. (a)



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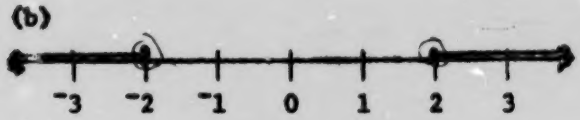

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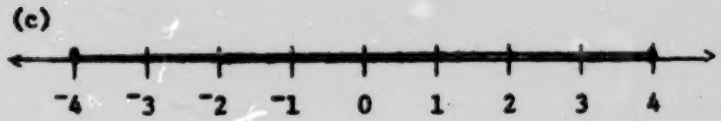
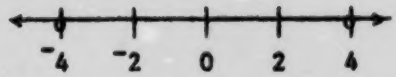


Criterion Test 03-03-04-02

1. (a) 7 (b) 18 (c) -8
2. (a)



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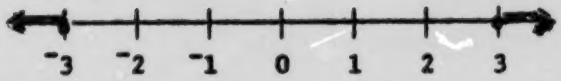

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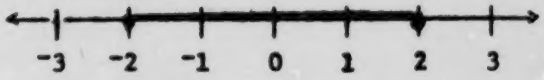
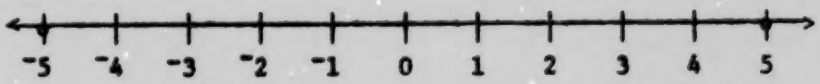


Answers:

Criterion Test 03-03-04-03

1. (a) 6 (b) 13 (c) -4

2. (a)



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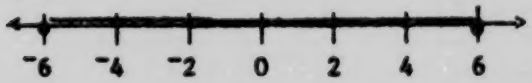

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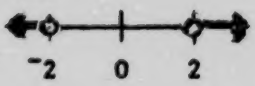

I. U. # 03-03-05

Addition

OBJECTIVES:

1. When asked to complete the sentence, "If a and b are each positive numbers or zero, then a + b = ___?___," you will write $|a| + |b|$.

2. When asked to complete the sentence, "If a and b are each negative numbers, then a + b = ___?___," you will write $-(|a| + |b|)$.

3. When asked to complete the sentence, "If a is a positive number and b is a negative number and $|a| \geq |b|$, then a + b = ___?___," you will write $|a| - |b|$.

4. When asked to complete the sentence, "If a is a positive number and b is a negative number and $|b| \geq |a|$, then a + b = ___?___," you will write $-(|b| - |a|)$.

5. Given a numerical expression involving addition, simplify the expression.

ACTIVITIES:

Study:
S & M: pages 82 - 84 (objectives 1,2,3,4,5)

Suggested exercises:
S & M: page 86; ex. 1 - 17, odd (objectives 1,2,3,4,5)

Criterion Test 03-03-05-01

1. Complete the sentence, "If a and b are each positive numbers or zero, then a + b = ___?___".

2. Complete the sentence, "If a and b are each negative numbers, then a + b = ___?___".

3. Complete the sentence, "If a is a positive number and b is a negative number and $|a| \geq |b|$, then a + b = ___?___.

4. Complete the sentence, "If a is a positive number and b is a negative number and $|b| \geq |a|$, then a + b = ___?___.

5. Simplify each expression.

   (a) $-20 + (-8) + 7 + 12$
   (b) $-3 + (-5) + [-(3 + 5)]$
   (c) $-0.7 + 1.72 + (-3.1) + 2$

Criterion Test 03-03-05-02

1. Complete the sentence, "If a and b are each positive numbers or zero, then a + b = ___?___".

2. Complete the sentence, "If a and b are each negative numbers, then a + b = ___?___".

3. Complete the sentence, "If a is a positive number and be is a negative number and $|a| \geq |b|$, then a + b = ___?___".

4. Complete the sentence, "If a is a positive number and b is a negative number and $|b| \geq |a|$, then a + b = ___?___".

5. Simplify each expression.

   (a) $17 + (-8) + 0 + (-14)$
   (b) $-3 + (-8) + (-7) + 5$
   (c) $-[7 + (-6)] + 14 + (-3)$

Criterion Test 03-03-05-03

1. Complete the sentence, "If a and b are each positive numbers or zero, then a + b = ___?___".

2. Complete the sentence, "If a and b are each negative numbers, then a + b = ___?___".

3. Complete the sentence, "If a is a positive number and b is a negative number and $|a| \geq |b|$, then a + b = ___?___".

4. Complete the sentence, "If a is a positive number and be is a negative number and $|b| \geq |a|$, then a + b = ___?___".

5. Simplify each expression.

   (a) $-14 + (-8) + 5 + (-9)$
   (b) $-3 + 6 + (-12) + 14$
   (c) $-15 + [-\{-6 - (-8)\}]$

Answers:

Criterion Test 03-03-05-01

1. $|a| + |b|$
2. $-(|a| + |b|)$
3. $|a| - |b|$
4. $-(|b| - |a|)$

5. (a) -9
   (b) -16
   (c) -.08

Criterion Test 03-03-05-02

1. $|a| + |b|$
2. $-(|a| + |b|)$
3. $|a| - |b|$
4. $-(|b| - |a|)$

5. (a) -5
   (b) -13
   (c) 10

Criterion Test 03-03-05-03

1. $|a| + |b|$
2. $-(|a| + |b|)$
3. $|a| - |b|$
4. $-(|b| - |a|)$

5. (a) -26
   (b) 5
   (c) -1

I. U. # 03-03-06

The Distributive Axiom

OBJECTIVES:

1. Given a variable expression, simplify by using the distributive property.

ACTIVITIES:

Study:

S & M: pages 88 - 89, (Objective 1)

Suggested exercises:

S & M: page 90; exercises 1 - 19, odd (Objective 1)

Criterion Test 03-03-06-01

1. Simplify each expression.

   (a) $37x + 12x$

   (b) $4x + 2y + 9x + 40y$

   (c) $5xy + 4x + (-2)xy + 8x$

   (d) $3x^2 + 5x + 2x + 4x^2$

Criterion Test 03-03-06-02

1. Simplify each expression.

   (a) $42x + 11x$

   (b) $12x + 3y + 5x + 7y$

   (c) $7x + 2xy + (-3)xy + 5x$

   (d) $4y^2 + 2y^2 + 7y$

Criterion Test 03-03-06-03

1. Simplify each expression.

   (a) $5x + 3x + 5 + 28x + (-11)$

   (b) $7x + 3y + 4x + 8y$

   (c) $2xy + (-3)x + 2xy + 7x$

   (d) $3x^2 + 2x + 5x^2 + (-2)x$

Answers to Criterion Tests

Criterion Test 03-03-06-01

1. (a) $49x$

   (b) $13x + 42y$

   (c) $3xy + 12x$

   (d) $7x^2 + 7x$

Criterion Test 03-03-06-02

1. (a) $53x$

   (b) $17x + 10y$

   (c) $12x + (-1)xy$

   (d) $6y^2 + 7y$

Criterion Test 03-03-06-03

1. (a) $36x + (-6)$

   (b) $11x + 11y$

   (c) $4xy + 4x$

   (d) $8x^2$

I. U. # 03-03-07

Multiplication

OBJECTIVES:

1. When asked to state the multiplicative axiom of one, you will write, "The set of real numbers has a unique element 1 having the property that for every real number a, $a \cdot 1 = a$ and $1 \cdot a = a$".

2. When asked to state the multiplicative property of zero, you will write, "For each real number a, $a \cdot 0 = 0$ and $0 \cdot a = 0$".

3. When asked to state the multiplicative property of -1, you will write, "For all real numbers a, $a(-1) = -a$ and $(-1)a = -a$".

4. When asked to complete the statement, "The product of a positive and a negative number is ___?___", you will write "a negative number".

5. When asked to complete the statement "The product of two positive numbers is ___?___", you will write, "a positive number".

6. When asked to complete the statement, "The product of two negative numbers is ___?___", you will write, "a positive number".

7. When asked to complete the statement, "The absolute value of the product of two real numbers is ___?___", you will write, "the product of the absolute values of the numbers".

8. Given an expression that contains an indicated product, simplify the expression.

ACTIVITIES:

Study:

S & M: pages 92 - 94 (Objectives 1, 2, 3, 4, 5, 6, 7, 8)

Suggested exercises:

S & M: pages 95, 96, exercises 1 - 29, odd
(Objective 8)

Criterion Test 03-03-07-01

1. State the multiplicative axiom of one.

2. State the multiplicative property of zero.

3. State the multiplicative property of -1.

4. Complete the statement, "The product of a positive and a negative number is ___?___".

5. Complete the statement, "The product of two positive numbers is ___?___".

6. Complete the statement, "The product of two negative numbers is ___?___".

7. Complete the statement, "The absolute value of the product of two real numbers is ___?___".

8. Simplify each expression.

   (a) $(-5)(-3) + (-2)(5)$
   (b) $-6[3 + (-4)]$
   (c) $3 - (-y) + 3y + 7 + 2y$

Criterion Test 03-03-07-02

1. State the multiplicative axiom of one.

2. State the multiplicative property of zero.

3. State the multiplicative property of -1.

4. Complete the statement, "The product of a positive and a negative number is ___?___".

5. Complete the statement, "The product of two positive numbers is ___?___".

6. Complete the statement, "The product of two negative numbers is ___?___".

7. Complete the statement, "The absolute value of the product of two real numbers is ___?___".

8. Simplify each expression.

   (a) $(-6)(-8) + (-2)(15)$
   (b) $-3[8 + (-4)]$
   (c) $8 - (-2y) + (-3)y + 7 + 4y$

Criterion Test 03-03-07-03

1. State the multiplicative axiom of one.

2. State the multiplicative property of zero.

3. State the multiplicative property of -1.

4. Complete the statement, "The product of a positive and a negative number is ___?___".

5. Complete the statement, "The product of two positive numbers is ___?___".

6. Complete the statement, "The product of two negative numbers is ___?___".

7. Complete the statement, "The absolute value of the product of two real numbers is ___?___".

8. Simplify each expression.

   (a) $(5)(-3) + (-2)(-5)$
   (b) $-6[(-3) + (4)]$
   (c) $3 + (-y) + 3y + (-7) + 2y$

Answers:

Criterion Test 03-03-07-01

1. The set of real numbers has a unique element 1 having the property that for every real number a, $a \cdot 1 = a$ and $1 \cdot a = a$.

2. For each real number a, $a \cdot 0 = 0$ and $0 \cdot a = 0$.

3. For all real numbers a, $a(-1) = -a$ and $(-1)a = -a$.

4. a negative number

5. a positive number

6. a positive number

7. the product of the absolute values of the numbers.

8. (a) $+5$
   (b) 6
   (c) $10 + 6y$

Criterion Test 03-03-07-02

1. The set of real numbers has a unique element 1 having the property that for every real number a, $a \cdot 1 = a$ and $1 \cdot a = a$.

2. For each real number a, $a \cdot 0 = 0$ and $0 \cdot a = 0$.

3. For all real numbers a, $a(-1) = -a$ and $(-1)a = -a$.

4. a negative number

5. a positive number

6. a positive number

7. the product of the absolute values of the numbers

8. (a) $+18$
   (b) -12
   (c) $15 + 3y$

Answers (continued)

Criterion Test 03-03-07-03

1. The set of real numbers has a unique element 1 having the property that for every real number a, $a \cdot 1 = a$ and $1 \cdot a = a$.

2. For each real number a, $a \cdot 0 = 0$ and $0 \cdot a = 0$.

3. For all real numbers a, $a(-1) = -a$ and $(-1)a = -a$.

4. a negative number

5. a positive number

6. a positive number

7. the product of the absolute values of the numbers

8. (a) -5
   (b) -6
   (c) $4y + (-4)$

I. U. # 03-03-08

The Reciprocal of a Real Number

OBJECTIVES:

1. When asked to state the axiom of reciprocals, you will write, "For every real number a except 0, there is a unique real number 1/a, such that $a \cdot 1/a = 1$ and $1/a \cdot a = 1$."

2. Given a real number, write its reciprocal (multiplicative inverse).

3. When asked to state the property of the reciprocal of a product, you will write " $1/ab = 1/a \cdot 1/b$, $(a \neq 0$ and $b \neq 0)$".

4. Given an expression that requires the use of the axiom of reciprocals, simplify the expression.

ACTIVITIES:

Study:
S & M: pages 97 - 98 (Objectives 1, 2, 3, 4).

Suggested exercises
S & M: page 99; ex. 1 - 12 (Objective 2).
page 100; ex. 1 - 25, odd (Objective 4).

Criterion Test 03-03-08-01

1. State the axiom of reciprocals.

2. Write the reciprocal of each number.

   (a) $-1/8$
   (b) $3/x$
   (c) 8

3. State the property of the reciprocal of a product.

4. Simplify each expression.

   (a) $6ab(-1/6)$
   (b) $(-40x^3)(1/10)$
   (c) $1/2\ (8x + 10)$

Criterion Test 03-03-08-02

1. State the axiom of reciprocals.

2. Write the reciprocal of each number.

   (a) $-3/8$
   (b) $4/x$
   (c) -12

3. State the property of the reciprocal of a product.

4. Simplify each expression.

   (a) $7xy(-1/7)$
   (b) $1/8\ (-48x^2)$
   (c) $1/3\ (9x + 12)$

Criterion Test 03-03-08-03

1. State the axiom of reciprocals.

2. Write the reciprocal of each number.

   (a) $-2/9$
   (b) $1/ab$
   (c) 14

3. State the property of the reciprocal of a product.

4. Simplify each expression.

   (a) $-1/9\ (9xy)$
   (b) $(-25x^2)(-1/5)$
   (c) $-1/4(12 + 20x)$

Answers:

Criterion Test 03-03-08-01

1. For every real number a except 0, there is a unique real number 1/a, such that $a \cdot 1/a = 1$ and $1/a \cdot a = 1$.

2. (a) -8
   (b) x/3
   (c) 1/8

3. $1/a \cdot b = 1/a \cdot 1/b$, ($a \neq 0$ and $b \neq 0$)

4. (a) $-ab_3$
   (b) $-4x$
   (c) $4x + 5$

Criterion Test 03-03-08-02

1. For every real number a except 0, there is a unique real number 1/a, such that $a \cdot 1/a = 1$ and $1/a \cdot a = 1$.

2. (a) -8/3
   (b) x/4
   (c) -1/12

3. $1/a \cdot b = 1/a \cdot 1/a$, ($a \neq 0$ and $b \neq 0$)

4. (a) $-xy$
   (b) $-6x^2$
   (c) $3x + 4$

Criterion Test 03-03-08-03

1. For every real number a except 0, there is a unique real number 1/a, such that $a \cdot 1/a = 1$ and $1/a \cdot a = 1$.

2. (a) -9/2
   (b) ab
   (c) 1/14

3. $1/a \cdot b = 1/a \cdot 1/b$, ($a \neq 0$ and $b \neq 0$)

4. (a) $-xy$
   (b) $5x^2$
   (c) $-3 + (-5x)$

END OF PACKAGE # 03-03